

President Participates in Energy Conservation & Efficiency Panel

National Renewable Energy Laboratory
Golden, Colorado

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9:19 A.M. MST

THE PRESIDENT: Please be seated. Thank you. Thank you all. Thanks for having me. I'm honored to be at the National Renewable Energy Lab -- which will be henceforth called NREL. (Laughter.) We -- I have come today to discuss unbelievable opportunities for our country to achieve a great national goal, and that is to end our addiction on oil.

I know it sounds odd for a Texan to say that. (Laughter.) But I have spent a lot of time worrying about the national security implications of being addicted to oil, particularly from parts of the world where people may not agree with our policy or our way of life, and the economic security implications of being hooked on oil, particularly since the demand for oil is rising faster than the supply of oil. And any time that happens it creates the conditions for what could be price disruption and price spikes at home are like hidden taxes on the working people of our country.

And so we're here to discuss ways to achieve this really important national goal. And there's no better place to come than NREL, and I want to thank you all for hosting me. I appreciate -- (applause.) I really appreciate the scientists and dreamers and, more importantly, doers who work here to help achieve this important goal.

I recognize that there has been some interesting -- let me say -- mixed signals when it comes to funding. The issue, of course, is whether or not good intentions are met with actual dollars spent. Part of the issue we face, unfortunately, is that there are sometimes decisions made, but as a result of the appropriations process, the money may not end up where it was supposed to have gone. I was talking to Dan about our mutual desire to clear up any discrepancies in funding, and I think we've cleaned up those discrepancies. My message to those who work here is we want you to know how important your work is; we appreciate what you're doing; and we expect you to keep doing it and we want to help you keep doing it. (Applause.)



I want to thank Dan. He's going to be saying some stuff here in a minute, so we're not going to -- I'm just going to thank him. I want to thank your staff for hosting us. It's a pain to host the President. (Laughter.) Anyway, you've done a fine job. I want to thank the Governor of the state of Colorado, Bill Owens, for joining us. (Applause.) Your United States Senator Ken Salazar -- thanks for coming, Ken, I appreciate it. (Applause.) The Congressman from this district, Bob Beauprez -- I appreciate you being here. (Applause.) The Congressman from the adjoining district, Mark Udall -- Mark, there you go. Thanks for coming. (Applause.)

We got all kinds of people -- we got the Mayor -- appreciate you coming, Mayor Baroch. Thanks for coming, Mayor. Just fill the potholes. (Laughter.) You got a great city -- thanks for having us. I appreciate the Statehouse folks -- Senator Andy McElhany and Joe Stengel from this district. I think that's right. Appreciate you coming. (Applause.) Thank you, Andy. Good to see you. I want to thank the directors -- thank everybody. (Laughter.)

So the challenge is what do we do to achieve objectives. In other words, we set goals -- so what do we need to do? What do we need to do as a nation to meet the goal? How can we fulfill our responsibilities that really say we understand the problems we face? So here's what we need to do.



First, we need to make sure we're the leader of technology in the world. I don't mean just relative to previous times in American history. I think this country needs to lead the world and continue to lead the world. And so how do you do that? One, first, there's a federal commitment to spending research dollars. In my State of the Union, I called on Congress to double the research in basic sciences at the federal level. This will help places like NREL. It will continue this grand tradition of the federal government working with the private sector to spend valuable research money in order to make sure we develop technologies that keep us as a leader.

In order for us to achieve this national goal of becoming less dependent on foreign sources of oil, we've got to spend money, and the best place to do that is through research labs such as NREL. Now, we also got to recognize that two-thirds of the money spent on research in the United States comes from the private sector. So it's one thing for the federal government to make a commitment of doubling the funding over a 10-year period, but we've got to recognize that most of the money is done through corporate America, through the private sector.

And one thing that seems like a smart thing to do for me is to make the tax rules clear. The research and development tax credit expires on an annual basis. It doesn't make any sense to say to corporate America or the private sector, plan for the long run, but we're not going to tell you whether or not the tax code is going to be the same from year to year. And so, in order to encourage that two-thirds of the investment in the private sector -- necessary to help us achieve national goals and objectives, one of which is to stay on the leading edge of innovation -- is to have the research and development tax credit a permanent part of our tax code.

Now, in order to get us less addicted to oil, we got to figure out where we use oil, and that's pretty easy when you think about it. We use a lot of oil for our transportation needs. And so if we can change the way we drive our cars and our trucks, we can change our addiction to oil. And laboratories such as this are doing unbelievably interesting work on helping us



change the way we drive our automobiles. And you're going to hear some interesting discussion with people on the front lines of these technological changes.

I just want to tell the American people three ways that we can change the way we drive our automobiles. One is through the use of hybrid vehicles. And Congress wisely increased the tax credit available to those who purchase hybrid vehicles. In other words, we're trying to increase demand for hybrid vehicles. You can get up to a \$3,400 tax credit now if you buy a hybrid vehicle. Hybrid vehicles are vehicles that use a gasoline engine to help charge a battery, and when the battery is charged, the battery kicks in, and if the battery gets low, the gasoline engine kicks back in to charge the battery. It's a hybrid -- in other words, two sources of power for the engine.

The new technological breakthrough, however, is going to be when we develop batteries that are able to enable an automobile to drive, say, the first 40 miles on electricity alone. Those are what we call plug-in hybrid vehicles. And yesterday I was at Johnson Controls, which is one of the private sector companies that are developing the new technologies to enable cars to be able to not need the gasoline engine to charge the battery. Now, that saves a lot of -- you can begin to think about how this technology is going to enable us to save on gasoline use, which makes us less dependent on crude oil, since crude oil is the feed stock for gasoline.

The idea is to have an automobile, say, that can drive 40 miles on the battery, as I mentioned. But if you're living in a big city, that's probably all you're going to need for that day's driving. And then you can get home and plug your car right into the outlet in your house. This is coming. I mean, we're close to this. It's going to require more research dollars. The budget I submitted to the Congress does have money in it for this type of research for new types of batteries. But I want the people to know we're close. The hybrid vehicles you're buying today are an important part of making sure you save money when it comes to driving. But they're going to change with the right research and development. Technology will make it so that the hybrid vehicles are even better in getting us less addicted on oil, and making it good for the consumer's pocketbook.

Secondly, there is a fantastic technology brewing -- I say brewing, it's kind of a catch on words here -- (laughter) -- called ethanol. I mean, it's -- there's a lot of folks in the Midwest driving -- using what's called E85 gasoline. It means 85 percent of the fuel they're putting in their car is derived from corn. This is exciting news for those of us worried about addiction to oil. You grow a lot of corn, you're less dependent on foreign sources of energy. Using corn for fuel helps our farmers and helps our foreign policy at the same time. It's a good deal.

The problem is we need more sources of ethanol. We need more -- to use different products than just corn. Got to save some corn to eat, of course. (Laughter.) Corn flakes without corn is kind of -- (laughter.) And so one of the interesting things happening in this laboratory and around the country is what's called the development of cellulosic ethanol. That's a fancy word for using switch grass, corn -- wood products, stuff that you generally allow to decompose, to become a source of energy.

And as our fellow citizens begin to think to whether or not it makes sense to spend research, imagine -- dollars on this technology, imagine people in the desert being able to grow switch grasses that they can then convert into energy for ethanol for the cars that they're driving there in Arizona. All of a sudden the whole equation about energy production begins to shift dramatically. And we're going to hear a lot about cellulosic ethanol.

Finally, hydrogen fuel cells. It's not a short-term solution, or an intermediate-term solution, but it's definitely a long-term solution. It will help us achieve grand objectives, less dependence on oil, and the production of automobiles that have zero emissions that could harm our air. And we'll talk a lot about hydrogen fuel cells.

Finally, I do want to talk about technologies that will enable us to change the way we power our homes and businesses, which is the second part of the strategy, the Advanced Energy Initiative strategy.

First of all, there's huge pressure on natural gas -- people in Colorado know what I'm talking about. We've been using a lot of natural gas for the generation of electricity. And we got to change that. Natural gas is important for manufacturing, it's important for fertilizers. But to use it for electricity is causing enormous pressure, because we're not getting enough natural gas produced.

One way to alleviate [sic] the pressure on price is to expand the use of liquified natural gas through new terminals. And I want to thank the Congress for passing new siting rights in the energy bill that will enable us to have more terminals for us to be able to receive liquified natural gas from parts of the world that can produce it cheaply -- liquified, and then ship it to the United States.

But the other way to take the price off of gas is to better use coal, nuclear power, solar and wind energy. Now, when you hear people say coal, it causes people to shudder, because coal -- it's hard to burn it. But we have got -- we're spending about \$2 billion over a 10-year period to develop clean coal technologies. If technology can help the way we live, technology can certainly help change the way we utilize coal. And it's important that we spend money on new technologies so we can burn coal cleanly, because we got 250 years worth of coal reserves.

One way to take the pressure off natural gas is to use coal more efficiently. We believe, by 2015 we'll have developed the first zero emission coal-fire electricity plant. We're making progress. We're spending money, research is good. The American taxpayers have got to know that by spending money on this vital research, that we're going to be able to use our abundant sources of coal in an environmentally friendly way, and help with your electricity bills.

Secondly, we've got to use nuclear power more effectively and more efficiently. We haven't built a plant since the 1970s. You're seeing now, France has built a lot of plants since the 1970s. They get about 85 percent of their electricity from nuclear power. And technology has changed dramatically, and I believe we can build plants in a safe way and, at the same time, generate cost-effective electricity that does not -- that the process of which won't pollute.

And so we've begun to, in the energy bill, begun to provide incentives for the nuclear power industry to start siting plants. It just doesn't make any sense to me that we don't use this technology if we're interested in becoming less dependent on foreign sources of energy and we want to protect our environment.

And finally, solar and wind technologies. We are -- we're also going to talk about that. NREL is doing a lot of important work on solar and wind technology. The vision for solar is one day each home becomes a little power unit unto itself, that photovoltaic processes will enable you to become a little power generator, and that if you generate more power than you use, you can feed it back into the grid.

I was, yesterday, in Michigan, and went to United Solar. And they've got some fantastic technologies. Dan was quick to remind me, others have fantastic technologies, as well. (Laughter.) I just hadn't seen them firsthand. But the American people need to know, with additional research dollars, which we're proposing to Congress, we're close to some important breakthroughs -- to be able to use this technology to help folks -- to help folks power their homes by the sun.

And finally, wind. We don't have a lot of turbines in Washington, but there's a lot of wind there, I can assure you of that. (Laughter.) But there are parts of the country where there are turbines.

They say to me that there's about six percent of the country that's perfectly suited for wind energy, and that if the technology is developed further, that it's possible we could generate up to 20 percent of our electricity needs through wind and turbine.

What I'm talking about is a comprehensive strategy. In other words, we're not relying upon one aspect of renewable energy to help this country become less dependent. We're talking about a variety of fronts. And we're willing to work with both the public sector and private sector to make sure that we achieve breakthroughs. And I'm fired up about it and so should the American people be. I mean, we're close to changing the way we live in an incredibly positive way. And, therefore, I want to thank the folks at NREL for being a part of this exciting movement. It's got to be pretty interesting to be one of these guys working on how to make switch grass go to fuel. I mean, it's got to make you feel good about your work, because you're doing the country a great service.

And so, with that in mind, I've asked Dan Arvizu to join us. He's the Director of NREL. That means he's -- that means you're the boss? (Laughter.)

MR. ARVIZU: Only part of the time. 16:18

THE PRESIDENT: Only part of the time.

MR. ARVIZU: Until I get home. (Laughter.)

THE PRESIDENT: Why don't you tell the folks -- he's a smart man. (Laughter.) Why don't you tell the folks what you do here so people can understand.

* * * Thank you, Mr. President. Let me first say on behalf of the Department of Energy and the many dedicated men and women of the National Renewable Energy Laboratory we are just absolutely delighted that you are here and we're happy to host you. It is an honor and a privilege to have you. We appreciate your leadership.

I also want to just tell you that the Advanced Energy Initiative which you are now very much promoting is a tremendous opportunity and shows a serious commitment to technology investment. Of course this is a message that resonates with all of us—we are all gainfully employed in this community... But I wanted you to know the people who work here are anxious to serve their country this way and it is a tremendous way to make a living and do something useful in the process. We want to make sure that the resources entrusted to us, that this is not misplaced trust. I am pleased to tell you that on the basis of the renewable energy and energy efficiency mission in which we operate there are tremendous breakthroughs going on across the spectrum of the technology areas—everything from solar to wind, biomass, and hydrogen to a large degree the technologies that will serve our country in the future. We think we can make some serious inroads to how we use energy both domestically and globally, and this is a global problem. We certainly understand that.

Our laboratory is unique because our mission was created for the purpose of moving a technology into the marketplace. One of the other things we have had to do as a result of that is to partner with the best minds in industry and academia so that essentially we could move that technology more quickly, and it informs our research agenda so that it is market relevant, so that businesses can be created and jobs and the economy can grow as a result of it.

The folks around this table certainly are great partners—certainly GM, Excel and others, lots of small companies, have found a way of taking these technologies into the marketplace. You had a chance to visit with me at the National Bioenergy Center. There is tremendous progress there-- advances in cellulosic biomass we're proud of the fact that with our partners, Genencor and Novosyme, we have taken enzymes that hydrolysize--that is break down molecules in plants into simple sugars—that we have taken that technology and over the last four years the cost has come down from \$3-5/gal to 25 cents/gallon so that we can begin to think about ethanol at about \$1/gallon--which is a tremendous advancement. And from that breakthrough in your initiative on the biorefinery/bioenergy we are looking at how to get that cellulosic bioethanol into production.

THE PRESIDENT: I think what he's saying is one of these days, we're going to take wood chips -- (laughter) -- put them through the factory, and it's going to be fuel you can put in your car. Is that right?

DR. ARVIZU: That's absolutely true. (Laughter and applause.)

THE PRESIDENT: That's the difference between the PhD and a C student. (Laughter.)

DR. ARVIZU: I didn't want to say that.

THE PRESIDENT: Yes, right. (Laughter.) Anyway, keep going. (Laughter.)

DR. ARVIZU: One of the other areas that we're tremendously excited by is photovoltaics. You mentioned the photovoltaics.

THE PRESIDENT: Explain what photovoltaics are. I threw it out there as kind of -- tell people what it means.

DR. ARVIZU: Photovoltaics is actually the direct conversion of sunlight to electricity through semiconductor material, and it's essentially what we use in computers for chips that power those things. And to a large degree, it's a technology that's been around a long time, but it has become much closer to commercialization. Now, in high-value markets it is commercial today.

* * * 20:55...We will talk about Excel--about how a photovoltaics program that can shape the peak of our electricity demand and allow us to avoid building new power plants to serve those

peaks. So even though the technology is still a bit more expensive than your conventional technology, the fact is that it is something that has great promise and the solar resources....

25 years ago I started working on first generation solar cells and in that time period I have watched that technology get to today's commercial technology and now that I am at NREL we are overseeing some absolutely phenomenal science and technology in photovoltaics. I recognize that the future is incredibly bright for solar and I am confident that it won't take us 25 years as it did last time to get that technology.

THE PRESIDENT: That's a good way to put it especially when the sun is shining.

THE PRESIDENT: See, what's changed is the global supply for fossil fuels is outstripping the -- the global demand is outstripping the global supply, and so you're seeing a price of the feedstock of normal energy going up, and technology driving the price of alternatives down. And that's why this is a really interesting moment that we're going to see. It has changed a lot of thinking. The price of natural gas and the price of crude oil has absolutely made these competitive alternative sources of energy real. And the question is, do we have the technological breakthroughs to make it such that it can get to your gas tanks.

* * * * * 22:35 Finally, the Advanced Energy Technology Initiative is absolutely the right investment at the right time. There is again a tremendous amount of science and technology at the ready. It needs to be harnessed with our partners in the private sector and let those market forces pull this stuff into the marketplace because that is really where the investment needs to be made. So I understand about policy always being one of those complicated issues. I like the Tom Clancy quote that says, "the difference between fiction and reality is that fiction has to make sense" and that can sometimes apply to the way we sometimes administer policy but I believe it is our opportunity to get us to the next stage.It's really important that technology be a piece of that.

THE PRESIDENT: Larry Burns, why don't you explain to folks what you do for a living.

23:34 MR. BURNS: I'm responsible for research and development and strategic planning for General Motors. And I've been doing that, working for General Motors for 37 years, actually.

THE PRESIDENT: Thirty-seven years?

MR. BURNS: Yes. I started out in kindergarten --

THE PRESIDENT: Yes, I was going to say. (Laughter.) You're obviously not in politics because your hair is not grey. (Laughter.)

You know, it's interesting, I bet you people don't know this -- a lot of people don't know -- there are 4.5 million automobiles on the road today that can either burn gasoline or ethanol -- called flex-fuel vehicles. Isn't that interesting? And people don't know that. In other words, the technology is available.

Pick it up from there. I'm trying to give you -- (laughter.)

* * * * * It is a great opportunity to be here today to talk about both ethanol and hydrogen. GM, in 1999, started building flexible fuel vehicles

THE PRESIDENT: Tell people what a flex-fuel vehicle is. What is it? Tell them what it is.

MR. BURNS: What it is, it's a vehicle that can burn both gasoline and E-85 ethanol. As you explained, it's 85 percent ethanol and 15 percent gasoline. So any mixture between gasoline and E-85 a vehicle can burn. And in fact, E-85 burns cleaner and yields higher horsepower than gasoline, it's renewable and it can be homegrown. So we think it's an ideal fuel.

THE PRESIDENT: Does it cost much to make the engine --

MR. BURNS: No, no, actually not. It's a pretty straightforward thing for us to do. The fuel injectors in your engine have to be changed, but this is one of the reasons we can do it in high volume and give our customers the choice.

THE PRESIDENT: In other words, this isn't something that's going to be real expensive to the consumer, if somebody wants a flex-fuel vehicle?

MR. BURNS: No, not in terms of the vehicle.

* * * * * 25:20 We have 1.5 M vehicles that we have built since 1999 and they are on the roads in all 50 states. We are building another 400,000 this year so we are pretty excited about its potential. That volume is important because like any new technology if it doesn't sell in high volume it's not going to have a very big impact. One of the ways we have embarked on making consumers more aware of E-85 is a campaign we just launched as part of the Superbowl and the Olympics a program called Live Green/Go Yellow. We have given it a lot of exposure. What we are doing is putting a badge on all of our E-85 vehicles that says "flex fuel" and all the gas caps we are making are yellow so that when the owner goes to buy gas they are reminded at the time that they have a choice on E-85 fuel. I think this is really going to build a lot of interest on the part of customers.

THE PRESIDENT: But people are sitting there saying, well, okay, maybe you've manufactured the fuel from different sources, but do you have the automobiles to use it. And the point is the technology is already advanced. I mean, they're out there, people on the road using it. So the question is now, can we get the fuel manufactured close to where people are driving flex-fuel vehicles, or vice versa, so that we can get this technology expanded throughout the country.

* * * * * 26:40 And on that pathway, one of the nice things we offer is with OnStar GM technology all you have to do is push a button on your car and that will tell you where the nearest E-85 pump is. So we are going to help our customers find the E-85 as we work with governments and retailers to provide more E-85 pumps around the nation. One of the nice things is that the fuel

like...E-85 is that it is also a bridge to Hydrogen..the beauty of hydrogen is that it can come from so many different pathways including E-85. When you use hydrogen with a fuel cell the fuel cell is like a battery—it creates electricity. As long as you have hydrogen available it can create electricity so you don't have to plug it in and recharge it you refuel with hydrogen. It emits just water and it doesn't create carbon dioxide and it is twice as efficient as a gasoline engine but even better yet from our perspective, it has one-tenth as many moving parts in it as a gasoline engine which is a big deal for engineers developing the product. We think that is key to making it affordable and that affordability is key to high volume sales. Even beyond that we recognize that only 12% of the people in the world own automobiles. We think hydrogen technology can actually allow us to reinvent the car and make it even better and grow our business dramatically. So we see this as a business opportunity for us...progress with the technology. We believe that within the next 5-10 year time frame we will have a fuel cell system that can compete with gasoline systems.

THE PRESIDENT: We're spending \$1.2 billion over a five-year period on -- or 10-year period for hydrogen research. I would warn folks that I think the hybrid battery and the ethanol technologies will precede hydrogen. Hydrogen is a longer-term opportunity. It's going to take a while for hydrogen automobiles to develop, plus the infrastructure necessary to make sure people can actually have convenience when it comes to filling up your car with hydrogen. But, nevertheless, I'm pleased to hear that GM is joining the federal government on the leading edge of technological change.

MR. BURNS: The important part about that battery, too, is it's a stepping stone to the fuel-cell vehicle. We imagine our fuel-cell vehicles will have some form of storing energy, because as your car slows down, you want to capture that energy and store it. So it's not like we're making one investment here that doesn't help another one. They all come together -- the ethanol, the batteries and the fuel cells are really one and the same road map to get to the future that offers a lot of alternatives for our nation.

THE PRESIDENT: Great. Thanks for joining us.

MR. BURNS: Thank you.

THE PRESIDENT: Patty Stulp.

29:16 MS. STULP: Hi. Good morning, Mr. President.

THE PRESIDENT: You've got an interesting business.

MS. STULP: I do, thank you. I blend ethanol for a gasoline refinery.

THE PRESIDENT: You blend ethanol for a gasoline refinery.

MS. STULP: Would you like me to tell about it?

THE PRESIDENT: I wish you would. (Laughter.) Please don't ask me to tell you about it.

MS. STULP: I've been involved in ethanol industry for over 20 years. I grew up on a farm in Yuma County. I need to point out that Yuma County is the number one corn-producing county in the nation most years. I'm a fourth generation --

THE PRESIDENT: Number one corn-producing county in the country.

MS. STULP: It's in Colorado?

THE PRESIDENT: Really?

MS. STULP: We grow a lot of corn, about --

THE PRESIDENT: That's not what they told me in Iowa, but that's all right. (Laughter.) I believe you.

* * * I am a fourth generation member of my family that has been committed to production agriculture. I started a company, Ethanol Management Company, in 1984 to introduce ethanol to Colorado. A partnership with a small, independent refinery—Frontier Oil Refinery—led to the construction of a blending and storage facility here in Colorado and...Frontier's willingness to think outside the box and our commitment to supplying quality controlled ethanol has been a successful combination for both of us. They expanded their barrel; agriculture expanded its market.

Mr. President, the ethanol industry's growth has been remarkable. It took the ethanol industry 12 years to make the first billion, 10 years to reach the next billion, 3 years to make the 3rd billion, and they increased capacity by a billion gallons last year.

This kind of rapid growth means the supply and demand doesn't always grow at the same rate and there is going to be times like today when ethanol's supply is not quite keeping up with the demand. Right now, there are 31 brand new plants under construction. There are 9 existing facilities that are expanding. The ethanol industry will quickly catch up. The ethanol industry is right on target to meet the demands in the Energy Policy Act. But producing ethanol from cellulose has the potential to greatly increase that volume. I believe corn based ethanol production can serve as the basis for the development of a cellulose foundation. I get really excited thinking about biorefineries where you have corn based ethanol, cellulose conversion, and they can provide fuel. I love a quote that Henry Ford did ... in 1929. Henry Ford said we can get fuel from fruit, sumac by the road, apples, wheat, sawdust—almost anything. He pointed out then that ethanol produced from one acre of a field of potatoes will produce enough fuel to

cultivate that for 100 years. He ended his quote by saying it remains for someone to find out how this fuel can be produced. A commercially better fuel, at a cheaper price than we now know. 77 years later, with the combined efforts of research and development, strong government leadership, strong agriculture, the ethanol production industry in cooperation of the petroleum industry, we can meet Henry Ford's challenge. We can be an important part of this country's ethanol solutions.

I'd like to talk for a minute about production agriculture...Production agriculture, like most of America last year was adversely affected by the hurricanes. We harvested a crop that was lower....the market demand for corn for ethanol was more important last year than it has ever been in value partially because of the damage to locks and dams. Ethanol is now the third largest use of American corn. Last year the ethanol industry consumed over 11% of the corn produced in this country. Ethanol plants are helping to boost rural communities by creating jobs, adding to the tax revenue, and creating business opportunities for the local businesses.

I think the Energy Policy Act of 2005 set the goals. We need to work together to make sure the rules and regulations provide real benefits to rural America. We can make sure that the benefits of all the agriculture in rural America has to offer ...that we get some of the benefits to Main Street not just Wall Street. Bottom line—Ethanol Works for America. We can become an important part of expanding and diversifying our energy supply while adding environmental benefits and adding to the strength of America and agriculture.

THE PRESIDENT: Well said. Our economy -- a strong economy is one that needs a good farm economy. And the more markets there are for our farmers, the stronger the economy is going to be. And ethanol is just another market.

MS. STULP: Mr. President, we really appreciate your support of this program.

THE PRESIDENT: Well, listen it makes sense. Anybody who doesn't support it doesn't quite understand the problems we face. But thanks. Good job. You're a pioneer yourself.

MS. STULP: Thank you.

THE PRESIDENT: Colorado is famous for pioneers. (Laughter.) Bill Frey, straight out of Delaware, is that right?

35:09 MR. FREY: Straight out of Delaware, yes.

THE PRESIDENT: Welcome.

MR. FREY: Thank you.

THE PRESIDENT: Tell people what you do.

* * * * * I am involved at Dupont in looking at how we can take biotechnology to help grow the corporation. One element of that, the biggest element that I deal with on a daily basis, is the work we are doing in cooperation with NREL and others looking at how we will make the vision that you stated in the State of the Union around cellulose--cellulosic ethanol has a commercially viable option that is where we are spending a tremendous amount of our time. And I think that the relationship we have with NREL is a good example of what we are talking about—a government/corporate partnership to help to make that happen.

THE PRESIDENT: Are you dedicating a lot of dollars to research and development? I know you are in general, but how about to alternative sources of energy?

MR. FREY: Absolutely. Absolutely. And we're doing it in two regards -- most of the discussion so far has been around the issue of fuels as an output. We do a lot of work in terms of using cellulose-based or using corn-based raw materials to make materials, as well.

* * * * * We are about to open mid-year this year the largest aerobic fermentation facility in... Tennessee to make a material that goes into a fabric and, I think, Mr. President, you may have actually seen an example of that during your tour this morning of a fabric that will be produced from corn so in addition to fuel and benefits of fuel in reducing imports of fuel, we are also looking at how we can do that in the material world—how there might be raw materials that we can derive from plant-based sources.

THE PRESIDENT: Let's see what I can ask you here. (Laughter.) What is your relationship -- what is the nature of the relationship with NREL? When you say you work with NREL, tell people how the private sector and government entities interface.

MR. FREY: People have mentioned bio-refinery -- I think probably everyone so far has mentioned bio-refinery

-- and we're working very closely with NREL -- NREL, of course, has had a number of years of being in the space looking at renewable energy, doing a lot of the foundation work that allows us to now look at how we're going to commercialize cellulose. So we're doing a lot of work in the area of bio-refinery with NREL, looking at how we can take a process which, today, has challenges associated with the economics of doing it, so it's an issue of economics. It's not a technology issue, the technology works. It's the economics of that technology. So we're spending a lot of time on trying to solve those problems.

THE PRESIDENT: Do you have people here from your company coming -- here a lot?

MR. FREY: Actually, there are people meeting today off-site, because of this particular event -- (laughter.)

THE PRESIDENT: I said I was a pain. Look, I said it up front. (Laughter.)

38:09* * * * * We get together on a regular basis. The Department of Energy has been very helpful as well in terms of helping to pattern this entire area. We have made a lot of progress. We are really looking forward to what we believe is the next stage, and that is to go to a commercial free project...

THE PRESIDENT: Part of it is the process of converting the switch grass to fuel, and part of it is to make sure the manufacturing process yields a cost-effective product. And that's a lot of what you're discussing, which is important.

MR. FREY: And it's important, I think, also for a lot of the constituents to know that there isn't an either/or situation as it relates to the type of work that we're doing with cellulose. There's some confusion at times as to is cellulosic going to take the place of corn-based ethanol, and, of course, it's not going to at all.

THE PRESIDENT: The answer is, no. We have plenty of demand. I mean, there's going to be a lot of cars. We've only got 4.5 million cars -- what are there, 220 million cars in America? And by the way, just to make sure everybody's expectations are set, our fleet is not going to change overnight. It takes a while. When you get new technologies available for people to buy -- hybrid vehicles or flex-fuel vehicles -- it takes a while to change a 220-million car fleet to a modern fleet.

And so what we're talking about is an evolution, so people don't have the expectations that overnight there's going to be millions of people driving hybrid vehicles or -- we want them to be. It's just going to -- from a practical perspective, it takes a while.

39:40 * * * * * In terms of the project, thanks to your leadership, Mr. President, we are very happy about the push and the emphasis that you have given to this issue. It really is an issue that can be solved. We can, in fact, make this happen. It is a matter of the will to make this happen.

THE PRESIDENT: I think part of this deal today is to help develop national will. Most Americans understand the problems. And so, thanks for joining. You did a fine job. Tell them back -- hello there in Delaware.

MR. FREY: All right. I'm sure they're watching --

THE PRESIDENT: They're watching. Well, give them a wave.

MR. FREY: Okay. (Laughter.)

THE PRESIDENT: Lori Vaclavik.

THE PRESIDENT: Vaclavik. It's a very -- you're an interesting addition to the panel. Besides being a fine person, tell people what you do. I think people will find this interesting.

40:28 MS. VACLAVIK. Thank you, Mr. President. I am Lori Vaclavik and I am the Executive Director of Habitat for Humanity of Metro Denver. I know that you have worked with Habitat homes as a volunteer and that you and many people know that the mission of Habitat for Humanity is to build decent, affordable homes which are sold to low income families. But, what most people do not about Habitat for Humanity is that we are also building some of the most

energy efficient homes in the United States and nowhere is that more true than in Denver, Colorado. The reason that Habitat for Humanity wanted to improve the energy performance of our homes, well there are three main reasons—First, Habitat for Humanity is currently building more than 20,000 homes a year. That is one home every 26 minutes. As one of the largest homebuilders in the world, we believe we have an obligation to be good stewards of the earth's resources. Second, since our homes are sold to low income buyers, we need to ensure that they are affordable to own, not just to purchase, and providing for low cost utility bills is one of the primary ways that we can do that. And, finally, we want to set an example for the home building industry that says that if Habitat for Humanity as a non-profit builder of affordable homes can build energy efficient homes, then all the homebuilders can and should.

Homes account for 37% of US electricity consumption, 22% of all US primary energy consumption, so looking at how our homes consume energy is an important part of an energy plan. We certainly all see the impact the high cost of heating bills has had on many of us this winter, and it is an impact that is especially severe on lower income households. In 2005, Habitat for Humanity and NREL came together to design and construct the ultimate example of an energy efficient home, which is a net-zero energy home. A net-zero energy home means that the home will produce as much energy as it consumes on an annual basis—the result being that it is a net-zero energy consumption. We start by making sure the home is super insulated to utilize passive solar gain and that it incorporates solar technologies. This home has a solar hot water heating system and one of those photovoltaic systems that provides the home's electricity—it is what you described in your opening remarks. That home is a power generator. The home system is connected to the power grid so that the home can draw power when it is not producing enough but also so that the home can return excess energy to the grid when it is producing more than it needs—the result will be a net-zero energy usage on an annual basis. So we are monitoring the home through the Building America Program for a year. We have data on 50 days so far, which are the days including January and mid-February. Of those 50 days, on 6 of them the roof was completely covered with snow, so it generated no energy production. Nonetheless, it produced 83% of the energy used, making us very optimistic that at the end of the year we will show a true net-zero energy performance.

Mr. President, I want to tell you the best thing about this house. In October of last year the Habitat for Humanity net-zero energy house became a home for a single mother named Amy and her two young boys. As a low income wage earner, Amy thought the American dream of home

ownership was out of her reach but today she is living that dream in a beautiful, warm, affordable, highly energy efficient home. In addition to being able to afford her mortgage payments each month, Amy may be the only resident in the Denver area who opens her utility bill with excitement each month because she knows that it too will be affordable. This home is proof that today's technologies can transform the way we live in our homes and the impact that we have on our earth—which is the ultimate Habitat for Humanity.

* * * * *

THE PRESIDENT: Great, thanks -- well-spoken. If anybody in the Denver area wants to contribute to help somebody's life be a better life, join Habitat for Humanity. If you want to -- the truth of the matter is, I was just thinking about -- we're talking about power and power sources and everything, the true power of the country is the hearts and souls of citizens who volunteer to help change people's lives. So thanks. Beautiful statement -- using some technology to help somebody. But you're right, the great source of inspiration is the fact that we got a new homeowner. Yes, that's neat.

Welcome. Dale, step forth. (Laughter.)

45:09 MR. GARDNER: I'm here, sir.

THE PRESIDENT: Good. Reporting for duty. Are you gainfully employed?

MR. GARDNER: I am. (Laughter.) As long as you're kind to my boss. (Laughter.)

THE PRESIDENT: As long as Congress quits earmarking. Anyway.

MR. GARDNER: Well, we could talk about that, too. (Laughter.) I am here at NREL, but I directly support the hydrogen program back at the Department of Energy.

THE PRESIDENT: Great.

* * * * I am here at NREL but I directly support the Hydrogen program back at the Department of Energy. As you pointed out, the Hydrogen program is our long-term strategy for energy security and environmental security here in the United States. In biomass and solar we have a foothold in the portfolio already. In Hydrogen we don't for two main reasons.

One, there are significant R&D challenges. We have research and development we have to do to make sure we understand how to implement the hydrogen economy. And, secondly, this is a game changer because we are going to have to put in a whole new infrastructure. Think of the gasoline infrastructure today that we have built up over the last 100 years. For hydrogen to be our transportation fuel, we have to begin to replace that. So that is why when three years ago in your State of the Union you announced the Hydrogen Fuel Initiative. And, if you would like, since you probably don't get a briefing every morning on that, I will give you an update on what we have done in the last three years.

First of all, this is a huge program in terms of not just the Federal government, but working with our partners. We have today over 300 research and development demonstration projects going on across this country with the best minds in the country working on these programs—200 large and small businesses; 80 universities; 40 institutes and professional associations; and 20 laboratories such as NREL across the country—all contributing to this effort. What we are trying to do is by the year 2015 have proven these technologies with our partners such that industry can then say, 'We've got it from here.' Because in the long run, it is not the government that is going to implement this Hydrogen Economy, it is going to have to be the industry partners that we see here at the table.

THE PRESIDENT: So like if you got a two-year-old child, when the person gets to be 12, maybe thinking about driving a car, all of a sudden, the technology becomes more real -- pretty close. For a guy 59, 10 years is a lot. (Laughter.) If you're two, it's not all that much. (Laughter.) It's conceivable that a two-year-old today could be taking a driver's test in a hydrogen-power automobile.

Keep going.

MR. GARDNER: So here's what we're doing. The major technological challenges -- I can boil them up into three areas. There are many, but here is a good way to think about it. The first is production of hydrogen. Hydrogen, even though it's the most common element in the universe, here on Earth it's not found freely. It's bound up into these larger molecules and, therefore, it takes us energy and dollars to break it free. So that's the main thing.

THE PRESIDENT: One reason why we need to expand nuclear power is to be able to help manufacture ample quantities of hydrogen to help change the way we live.

MR. GARDNER: That's exactly right. We can take that electricity from a nuclear power plant, electrolyze water, which just means break the hydrogen free from the oxygen and then have it for a fuel source. So production is one of our big goals. And the goal there, of course, is to make the cost of the hydrogen competitive with gasoline today; otherwise you and I won't want to buy it at the filling station.

THE PRESIDENT: Correct.

MR. GARDNER: The second area is storage. This is really an interesting one. Because hydrogen is the simplest element, it has the complexity that affects us in terms of using hydrogen in vehicles. We have to be able to put hydrogen in a tank, just as we do gasoline. Well, because it's so light, and its density is so low, it's really hard to pack enough of it into a tank that's not the size of your whole trunk, such that we can get 300 miles down the road. And for Larry to sell a car to one of us, we want to go at least 300 miles more, especially when you're driving in Texas, a long way between filling stations. (Laughter.)

THE PRESIDENT: Yes. And we want more than one seat in the automobile. (Laughter.)

49:21* * * * * So the ways that we can store hydrogen today is by compressing it. High pressures in tanks—up to 10,000 lb/sq in, or by liquefying—making it very, very cold. Both of those are

intermediate options but they are not good options in the long term. So we have established three centers of excellence in this nation, in fact, NREL is one, looking at new, novel breakthrough technologies—substances—carbon for example hydrides they can absorb the hydrogen put it into a small area and then release it out of this tank if you will into the fuel cell when it is time to drive your car. This really needs a breakthrough. In fact, it is the area that is getting the most attention with the dollars you are sending over to the hydrogen program.

Lastly, is the fuel cell itself. If we could produce the hydrogen, get it up to the fuel cell...we have to make that fuel cell cost effective so that it is about what Larry would charge for a gasoline internal combustion engine and on top of that, durable. We don't change out our internal combustion engines in cars any more, they go a long ways. So we want to have the fuel cell that is essentially the replacement for that engine to have that same durability. 5000 hours is our goal by 2015. We are already up to about 2000 hours and making great progress. So that is what we are doing.

Our partnerships with industry are huge. We have a partnership known as FreedomCAR and fuels partnership with the three major US car companies and the five major US energy companies are also part of this. That partnership helps guide this research to make sure that as we produce these technologies and we throw them over the fence to industry that they are implementable in this infrastructure. In fact, Larry is the executive co-chair of the steering group of that whole partnership. We also have just formed up in the last 1 ½ years, a partnership with utilities called the Hydrogen Utility Group (HUG). In fact, Excel is a member... You might ask what do utility companies have to do with hydrogen transportation. Hydrogen is not just a fuel. It is an energy carrier. Think of it as electricity. Electricity is the way that Pat moves energy around our country today. Hydrogen can be that also and utility companies are getting on board, understanding that as we implement this infrastructure, this is going to have a fundamental affect on the way we look at energy.

THE PRESIDENT: So you've been looking at this for three years. Is this like science fiction, or are we talking about something that you think will come to fruition?

MR. GARDNER: This is going to happen.

THE PRESIDENT: Pretty exciting, isn't it?

MR. GARDNER: It's going to be out in the middle of the century. It's not going to be something that's going to happen in the next 15 or 20 years, but it's going to be the way our kids and our grandkids view the energy structure of our country. It's very exciting work.

THE PRESIDENT: In 1981, I don't think anybody ever thought there would be such a thing as email. Matter of fact, we were still writing letters longhand, if I recall. Typewriters were kind of the -- now it's computer. It's amazing what research and development can do to the way we live.

Payphones to cell phones in 20 years. I think what we're hearing is change of lifestyle in incredibly important ways in the research that's taking place.

You can't have -- we live in an instant gratification world, so we got to be wise about how we make investments. Part of the strategy is intermediate term, part of the strategy is long-term. Thanks for explaining an important long-term strategy. You did a fine job, boiled it down, simplified it. Point one, two, three. (Laughter.) Thank you for joining us, and thanks for your work on that.

Finally, Pat Vincent, the President and CEO of --

53:29 MS. VINCENT: Public Service Company of Colorado.

THE PRESIDENT: Great. Thanks for joining us.

MS. VINCENT: Thank you.

THE PRESIDENT: You have a vested interest in all this.

MS. VINCENT: I do. I do. And I'd like to thank you for the opportunity to tell you about it.

* * * 53:34 I would like to tell you about three things today. First is our WindSource Program, and the second is the two partnerships we have here with NREL.

THE PRESIDENT: What is the main source of your power today?

MS. VINCENT: It's a mix between coal and natural gas.

THE PRESIDENT: Coal -- right, right -- 50-50?

MS. VINCENT: We have some nuclear in Minnesota. Depends on the state. Here in Colorado, it's predominantly natural gas.

THE PRESIDENT: And what states do you cover?

MS. VINCENT: We cover 10 states. We cover the panhandle of Texas.

THE PRESIDENT: Do you?

MS. VINCENT: We do.

THE PRESIDENT: People paying their bills down there? (Laughter.)

MS. VINCENT: They are -- they are.

THE PRESIDENT: That's good. A fine part of the country, I want to you know. Well, you don't need to name them all. A 10-state area.

MS. VINCENT: Yes, 10 states.

THE PRESIDENT: And you're based where?

MS. VINCENT: I'm based here in Denver, and this is our largest utility company here, is in Colorado. And we have a wind source program that has been around since 1998.

* * * * * and what that does is allow customers to voluntarily buy wind from us. They can buy it in blocks. They can buy up to 100% of their power needs. We serve about 30,000 customers on that program and it is not just residential customers it is business customers—IBM... Is also a customer and it has environmental benefits. We reduce the carbon dioxide by 100,000 Tons/year. But it also gives consumers a good feeling. We have thegreen e-seal and it comes from two wind farms in Colorado. There is a lot of wind in Colorado. It is a great program. And through your leadership in extending the tax credits... also just announced that we are going to add more than 250% on our system from wind by 2070.

THE PRESIDENT: So like when you analyze the wind turbine technology, is it advancing rapidly? Is there more advances being made -- or am I getting you out of your lane here?

MS. VINCENT: No, it's advancing rapidly. And what we're finding is like Dan talked about, the demand for solar, is that the demand for the turbines is starting to outstrip the supply. And a lot of it's going overseas. The production tax credit really helps us here because it kind of goes in boom and bust cycles, so that has really helped us levelize the demand and make them commercially feasible. And people like GE are making big strides in wind technology.

THE PRESIDENT: Good.

* * * * * The second programs we have are with NREL and we have two. The first is a wind to hydrogen program

MS. VINCENT: I don't know about your experience with wind, but it does blow intermittently here in Colorado and --

THE PRESIDENT: It does in Washington, too. (Laughter.)

MS. VINCENT: I wasn't sure if it was all the time, or just intermittently.

THE PRESIDENT: Lately, all the time. (Laughter.)

* * * * * But that is a challenge for us in generating electricity from wind so what we are looking at with NREL is if we can then take hydrogen, store it and use it to produce electricity later. And we are also at the same time exploring whether it makes more sense to use it as transportation fuel. So we are going to take a look at the economics of that. And the main challenge on wind is that variability and the intermittency of it. So this is a big deal to move wind forward another step. And the great thing we like about this is it is not just going to be tested here and then dropped.

We are going to be able to take the test system that we have and re-deploy it on our system. So it will actually go into commercial operation when the testing is done.

And then finally, we talked about photovoltaics—I like to say PV—it is much easier. We are working with NREL on a program for the best place to site those PV panels. NREL has a planning model here that looks at solar, looks at land usage; customer ownership and then we can overlay the data we have in our mapping systems that talk about loads and where customers are and put those two together and figure out where the best places for those solar panels are. And what Dan had mentioned....on the building or house...we can tell, for example in places where there is low population but high peak; we can shade the peaks so we don't have to build peaking plants. We are also....Peaking plants....hot in the summer...everyone turns on their air conditioners...

Then we don't have to build new power plants and one of our other jobs at Public Service is to open up the market for solar. So we offer rebates to customers when they put solar in and so they will help stimulate the market here....what Dan was talking about the solar panels going overseas...we want to make sure our market here is just as vibrant and robust so that the solar panels stay here.

THE PRESIDENT: By the way, this may interest you if you are -- these people manufacturing photovoltaic products can't make enough. I mean, the demand for these things is huge. And there's just not enough capacity. The plant we were at yesterday is going to double in size. They're making neat roofing materials, by the way. I'm not their marketing guy -- (laughter) -- just happens to be on my mind. What's interesting about the discussion is the utility industry needs alternative sources of energy in order for them to be able to do their job. I think that's what you're saying.

MS. VINCENT: Yes, and it's good our customers, it's good for the communities, and it's good for us --

THE PRESIDENT: Absolutely.

MS. VINCENT: -- our shareholders.

THE PRESIDENT: It's good for your customers, it's good for you.

MS. VINCENT: Yes.

THE PRESIDENT: And I know you feel that way. Managing peak electricity loads with alternative sources of energy makes a lot of sense.

MS. VINCENT: Yes, it does.

THE PRESIDENT: You did a fine job.

MS. VINCENT: Thank you.

THE PRESIDENT: So that's why we're here, to talk about a variety of options to achieve a great national goal. And there's no doubt in my mind we're going to achieve it. And it's exciting. It's exciting times to be involved with all aspects of this strategy. And you heard some of our fellow citizens describe to you what they're doing to be a part of this giant effort, giant effort to change the way we live, so that future generations of Americans will look back at this period and say, thank goodness there was yet another generation of pioneers and entrepreneurs willing to think differently on behalf of the country.

Thanks for coming. God bless. (Applause.)

END 10:20 A.M. MST

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